# *ETHEOSTOMA COLOROSUM* AND *E. BELLATOR*, TWO NEW DARTERS, SUBGENUS *ULOCENTRA*, FROM SOUTHEASTERN UNITED STATES

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## Abstract

Two new darters, subgenus *Ulocentra*, are described from Alabama and western Florida. Both are members of the *Etheostoma duryi* species group with the premaxilla free from the upper lip, and the vomer usually or consistently with one or a few teeth. Both usually have five branchiostegal rays and lack an orange-red band in the anal fin. The coastal darter, *E. colorosum*, is the only species of *Ulocentra* inhabiting the coastal streams of southern Alabama and northwestern Florida between the Perdido and Choctawhatchee rivers. It lacks a red ocellus anteriorly on the first dorsal fin, with red or orange color restricted to the last three to five membranes, and has other characters suggesting close affinity with *E. tallapoosae* and other as yet unnamed *Ulocentra* species from the Gulf Coastal Plain. Nuptial males of *E. colorosum* have a diagnostic series of small red or orange punctulations along the side and additionally have other associated pigment features. It is a slightly smaller species than *E. tallapoosae* and the scales are larger. The Warrior darter, *E. bellator*, is discontinuously distributed in the Black Warrior River system above the Fall Line in Alabama. Nuptial males have a red ocellus in the first membrane of the spinous dorsal fin. There are two series of elongate blotches on the midside separated by a pale area, and the bright orange stripe on the lower side and caudal peduncle is narrow. Two other species of *Ulocentra* also live in the upper Black Warrior system, *E. zonistium* with a characteristically banded first dorsal fin and *E. chermocki*, confined to the Turkey Creek drainage, the latter species most closely related to *E. bellator* but distinguished by different lateral pigmentation and a broad ventrolateral stripe in nuptial males.

## Introduction

Members of *Etheostoma* subgenus *Ulocentra* occur in Gulf Coastal drainages east of the Mississippi River, several eastern tributaries to the lower Mississippi River, the Tennessee and Cumberland river systems, and southern tributaries to the Ohio River. The presence of darters of this subgenus south of the Tennessee River system (Mississippi River drainage) has been known for many years. *Etheostoma coosae* was the first species to be described from the southern zone of the subgenus (Fowler, 1945). Four decades later, Bailey and Etnier (1988) described *E. zonistium*, which is distributed primarily in western, lower tributaries to the Tennessee River but also occurs in a few headwater branches of the Sipsey

Fork of the Black Warrior River system, Alabama. These headwater tributaries are just across the divide from the upper part of Bear Creek, a tributary to the Tennessee River. Suttkus and Etnier (1991) described two more species (*E. tallapoosae* and *E. brevirostrum*) of the subgenus. In early 1992 one of us (R. D. S.) and H. T. Boschung, independently discovered and studied an isolated form of subgenus *Ulocentra* in the Turkey Creek system, a tributary to the Locust Fork of Black Warrior River system, Jefferson Co., Alabama. It was described as *E. chermocki* by Boschung et al. later in 1992. Some of the data compiled by R. D. Suttkus are incorporated in this paper under their name, *Etheostoma chermocki.*

The darters described herein were first recognized many years ago and have become common knowledge. The details of their geographic distributions and their relationships to other close geographical forms, until recently, have remained poorly understood. The subgenus *Ulocentra*, as here interpreted, follows Bouchard (1977) and Bailey and Etnier (1988).

## Materials and Methods

Specimens of the new species and comparative material used are primarily from the collections of Academy of Natural Sciences of Philadelphia (ANSP); Auburn University (AUM); Cornell University (CU); Tulane University Museum of Natural History (TU); University of Alabama (UAIC); University of Florida including former Florida State University specimens (UF); University of Michigan Museum of Zoology (UMMZ); National Museum of Natural History (USNM); and University of Tennessee (UT).

Counts and measurements were made as described in Hubbs and Lagler (1958) except as follows. Transverse body scales were counted from the origin of the anal fin diagonally upward to the base of the spinous dorsal fin. Gill rakers, counted on the anterior arch of either the left or the right side, include both dorsal and ventral rudiments. Measurements were made with needle-point dial calipers and recorded to the nearest 0.1 mm. Trans-pelvic width was measured between the outer bases of the pelvic spines. Our measurements of the length of the spinous dorsal, soft dorsal and anal fins are the total lengths of these fins when depressed and not the length of the fin base. Names used for associated fish species follow Robins et al. (1991).

In the listing of type material, each catalog number is followed by the number of specimens examined and the range of standard length (SL) in millimeters, e.g., (10, 27–52). In addition to standard compass directions (with the following "of" deleted), the following abbreviations are used: Cr. = Creek, R. = River, mi = mile(s), airmi = airmile(s), trib. = tributary, Fk. = Fork, hwy = highway, rd = road, Co. = County, T = Township, R = Range, Sec = Section. In lists of materials not designated as types, the catalog number is followed by the number of specimens examined, enclosed in parentheses.

### **Etheostoma colorosum**, new species

Coastal Darter

Figures 1, 8, and 12

*Etheostoma simoterum*. Gilbert, 1891: 159 (misidentification, Sandy Cr. record). Stevenson, 1976: 37 (in key, characters, orange-sided darter). Mettee, O'Neil, and Harris, 1983: 24, 88 (in part; Hall Cr., Little Escambia Cr., Pollard Oil Field, AL).

*Etheostoma* sp. Bailey, Winn, and Smith, 1954: 143 (Orangestripe darter, Escambia R. records).

*Etheostoma (Ulocentra)* sp. Smith-Vaniz, 1968: 136 (in part, reports from Conecuh and Choctawhatchee River systems). Jenkins, 1976 (in part, undescribed species, distribution). Kuehne and Barbour, 1983: 97-98, *pl. 12* (in part, "Gulfcoast Snubnose Darter," characterized, range map in part). Gilbert and Walsh, 1991: 16 ("Gulfcoast snubnose darter," probable source of color illustration in Kuehne and Barbour).

Coastal Plain Darter, *Etheostoma* sp. Page and Burr, 1991: 30? (in part, *pl. 43* [not coastal darter], *map 346*, in part).

HOLOTYPE: Adult male, TU 162508, 50.1 mm standard length (SL), Pine Barren Creek, tributary to Escambia River at Still Road (T5N, R32W, Sec 20), Escambia County, Florida, 29 March 1992, R. D. Suttkus.

PARATOPOTYPES: TU 162509 (47, 34–54), collected with holotype are distributed as follows: TU 162509 (42), UMMZ 221365 (5); TU 152006 (36, 33–50), 22 April 1988, distributed as follows: TU 152006 (32), ANSP 169684 (2), CU 73644 (2); TU 154470 (27, 36–54), 21 March 1989, distributed as follows: TU 154470 (19), UAIC 10506.01 (4), UT 91.4202 (4); TU 157537 (24, 31–45), 3 March 1990, distributed as follows: TU 157537 (18), UF 92633 (4), USNM 324501 (2).

OTHER PARATYPES: TU 151947 (28, 34–51), Pine Barren Creek at Fla Hwy 99 (T5N, R32W, Sec 28), Escambia Co., Florida, 21 April 1988, distributed as follows: TU 151947 (24), UMMZ 221366 (4); and AUM 26759 (1, 47), Pine Barren Creek at Escambia Co. Rd 4, 2.3 mi W Bratt, Escambia Co., Florida.

ADDITIONAL MATERIAL EXAMINED BUT NOT DESIGNATED AS TYPES: **Perdido River drainage, Florida**. ESCAMBIA COUNTY: AUM 26016 (8), Brushy Cr. at Escambia Co. Rd 99, 2 mi W Walnut Hill (T4N, R33W, Sec 4), AUM 26742 (6), and TU 162538 (9).

**Escambia River drainage, Florida**. ESCAMBIA COUNTY: UF 54776 (2), Prittchett Mill Branch, 3.9 mi S Century at US Hwy 29 at Bluff Springs (T5N, R31W, Sec 24); UF 54817 (1), trib. to Canoe Cr. at Fla Hwy 4, 5.5 mi W junction with US Hwy 29 (T5N, R31W, Sec 8); UF 54835 (4), Canoe Cr. at Fla Hwy 4, 6.1 mi W junction with US Hwy 29 (T5N, R31W, Sec 8); UF 55915 (2), Mitchell Cr., trib. to Escambia R., 0.4 mi N McDavid at US Hwy 29 (T4N, R31W, Sec 10). **Alabama**. ESCAMBIA COUNTY: UMMZ 163552 (3), Big Escambia Cr. at Flomaton (T1N, R8E, Sec 33), TU 16518 (1); AUM 5506 (4), Cedar Cr., 3.9 airmi NE East Brewton (T2N, R10E, Sec 13); AUM 1076 (2), Escambia R. NE Atmore at Interstate Hwy 65 (T2N, R7E, Sec 4); AUM 26780 (4), Burnt Corn Cr. at Ala Hwy 41 N Brewton (T2N, R10E, Sec 20). CONECUH COUNTY: USNM 43494 (3), Sand Cr., 2.8 mi E Evergreen (T6N, R11E, Sec 36); UMMZ 165987 (8), Murder Cr. at Castleberry (T4N, R10E, Sec 24); UMMZ 155519 (6), Bear Cr., trib. to Murder Cr. at US Hwy 31, 2 mi S Castleberry (T4N, R10E, Sec 35); TU 159841 (72), Jordan Cr. at US Hwy 31, 4.9 mi S Fairview (T5N, R10E, Sec 35), and TU 162528 (34); TU 159829 (17), Spring Cr., 2.5 mi NW Centernary Methodist Church (T7N, R10E, Sec 9). BUTLER COUNTY: UMMZ 88738-39 (3), trib. to Persimmon Cr., 1 mi W Greenville at Ala Hwy 10 (T10N, R14E, Sec 22); UMMZ 128770 (1), Hawkins Cr., trib. to Persimmon Cr., 2.9 mi S Greenville (T9N, R14E, Sec 3); USNM 43527 (4), Greenville, AL (T10N, R14E); UMMZ 139155 (20), Rocky Cr., trib. to Persimmon Cr., 1 mi N Georgiana and 2.75 mi S Chapman (T8N, R13E, Sec 13). CRENSHAW COUNTY: TU 2581 (4), trib. to Patsaliga Cr., 20 mi W Luvergne at Ala Hwy 10 (T9N, R18E, Sec 30). PIKE COUNTY: TU 2605 (1), trib. to Indian Cr., trib. to Conecuh R., 8.4 mi W Troy at Ala Hwy 10 (T10N, R19E, Sec 25). COVINGTON COUNTY: AUM 21082 (3), trib. to Blue Cr., trib. to Conecuh R., 8.6 airmi NW Wing (T3N, R14E, Sec 31).

**Blackwater River drainage, Florida**. SANTA ROSA COUNTY: UF 54713 (22), Big Juniper Cr., 2.0 mi W Munson at Fla Hwy 4 (T4N, R27W, Sec 12), TU 31731 (13), TU 33842 (2), TU 56741 (72), and TU 106620 (12); UF 54781 (13), East Fork Coldwater Cr., 5.7 mi WNW Munson at Fla Hwy 4 (T4N, R27W, Sec 5), and TU 20940 (10); UMMZ 212001 (15), W Branch Juniper Cr., 2.1 mi S Munson, a campground off Hwy 191 (T4N, R27W, Sec 24, SW 1/4); UF 54978 (14), Sweetwater Cr., 1.3 mi E Munson at Fla Hwy 4 (T4N, R26W, Sec 16), UMMZ 163530 and 169783 (16); TU 57082 (116), Bear Cr., trib. to Sweetwater Cr., 1.3 mi E Munson at Fla Hwy 4 (T4N, R26W, Sec 16), TU 151585 (22), TU 154458 (67), TU 157516 (22), TU 157816 (2), and TU 162518 (10); UF 54962 (4), Big Juniper Cr., 5 airmi S Munson (T3N, R27W, Sec 12); UF 58237 (1), Alligator Cr., trib. to Juniper Cr., 6.0 airmi N Harold (T3N, R26W, Sec 30); TU 151591 (4), Big Juniper Cr., 1.0 mi E McLellan (T6N, R26W, Sec 31); TU 151595 (9), Turkey Cr., trib. to Big Juniper Cr., 3.2 mi NW Munson

(T4N, R27W, Sec 2); UF 58223 (2), Pond Cr., 2 mi WSW Milton at US Hwy 90 (T1N, R28W, Sec 9); UMMZ 165103 (6), Pond Cr., 3.9 mi W Milton along Fla Hwy 10 (T1N, R29W, Sec 1); UF 58196 (1), Pond Cr., 9.8 airmi NW Milton (T3N, R29W, Sec 33); TU 88877 (4), Pond Cr., 7.0 mi NW Milton at Fla Hwy 191 (T2N, R29W, Sec 15), TU 92033 (7), TU 94767 (11), TU 98571 (10), TU 100739 (4), TU 103115 (11), TU 105584 (16), TU 111392 (2), TU 116023 (5), TU 117581 (4), TU 120137 (3), and TU 124295 (2); UF 58351 (2), Blackwater R., 7.0 airmi NE Milton, 0.5 mi NE mouth Coldwater Cr. (T2N, R27W, Sec 16); TU 20524 (7), West Fork Big Coldwater Cr., 3.9 mi E Jay at Fla Hwy 4 (T5N, R29W, Sec 14); TU 27399 (9), Manning Cr., trib. to West Fork Big Coldwater Cr., 14 mi N Milton at Fla Hwy 87 (T3N, R28W, Sec 4); TU 152863 (7), West Fork Big Coldwater Cr. at Fla Hwy 87, 11.8 mi N Milton (T3N, R28W, Sec 10). OKALOOSA COUNTY: UF 54982 (1), Beaver Cr., trib. to Blackwater R., 5.4 mi E Munson at Fla Hwy 4 (T4N, R25W, Sec 18); UF 54838 (3), Blackwater R. at Fla Hwy 4, 4.5 mi NW Baker (T4N, R25W, Sec 22), and TU 23682 (6); UF 56182 (2), Narrows Cr., trib. to Panther Cr., 1.7 mi W Cannontown, about 10 airmi NW Crestview (T4N, R25W, Sec 12). **Alabama**. ESCAMBIA COUNTY: AUM 25995 (1), Blackwater R. at Escambia Co. Rd 4, 1 mi E Bradley (T1N, R13E, Sec 25), and AUM 26728 (2).

**Yellow River drainage, Florida**. OKALOOSA COUNTY: TU 3719 (17), Big Horse Cr., trib. to Yellow R., 2.7 mi E Blackman (T5N, R24W, Sec 24); TU 3151 (3), Horsehead Cr., trib. to Yellow R., 2.9 mi E Fla Hwy 85 at Fla Hwy 2 (T5N, R22W, Sec 15); UF 54992 (7), Silver Cr., 5.0 airmi SE Crestview (T2N, R23W, Sec 2), and UF 54738 (11); UF 54754 (4), Turkey Gobbler Cr., 8.2 airmi SW Crestview (T2N, R24W, Sec 17); UF 56167 (1), Gum Springs Cr., 3.5 mi N Milligan ( T4N, R24W, Sec 34); UF 55832 (1), Silver Cr. public lake drainage, 7 mi N Crestview (T4N, R24W, Sec 24); UF 57156 (5), Turkey Hen Cr., 6.5 mi S Crestview (T2N. R23W, Sec 8), and UF 54733 (3); TU 24085 (21), Laird Mill Cr., 100 yds. before entering Shoal R. (T3N, R22W, Sec 1); TU 24695 (4), trib. to Shoal R. from westside, 0.2 mi below railroad trestle (T3N, R23W, Sec 23); TU 24076 (3), Shoal R. cutoff, 6 mi upriver from Fla Hwy 85 bridge (T3N, R23W, Sec 35); TU 24653 (4), Yellow R. at mouth of nameless creek (T4N, R24W, Sec 35); TU 24647 (3), Horse Cr. at entrance to Yellow R. (T5N, R23W, Sec 29); TU 72819 (5), Yellow R., 4.6 mi W Fla Hwy 85 at Fla Hwy 2 (T5N, R23W, Sec 20), TU 82630 (6), TU 79807 (5), and TU 79701 (2); TU 80486 (4), Yellow R., 0.2 mi downriver from Fla Hwy 2 (T5N, R23W, Sec 20); TU 83099 (1), Yellow R., 3.5 mi SW Crestview at US Hwy 90 (T3N, R24W, Sec 15), TU 101923 (2), and TU 102315 (2); TU 81258 (4), Yellow R. at end of Fla Hwy 189, 2.9 mi S Holt (T2N, R25W, Sec 16); TU 80536 (1), Mill Cr., trib. to Yellow R., 1.1 mi N Milligan (T3N, R24W, Sec 15); TU 81660 (1), Horsehead Cr., trib. to Pond Cr., 3.2 mi SE Laurel Hill (T5N, R22W, Sec 15); AUM 14934 (3), Yellow R. between Oak Grove and Milligan (T4N, R24W, Sec 24); TU 102333 (3), Pond Cr., trib. to Shoal R., 1.0 mi NE Dorcos, Okaloosa Co. Rd 373 (T4N, R22W, Sec 26). WALTON COUNTY: TU 1749 (24), Pine Log Cr., 9.1 mi E Fla Hwy 85 at Fla Hwy 2 (T5N, R21W, Sec 28), and TU 82525 (2); UF 54362 (9), Pine Log Cr., 6.4 mi S Clear Springs (T4N, R21W, Sec 5); UF 54206 (17), Shoal R. at Fla Hwy 285, 4.3 mi S Stella (T4N, R21W, Sec 36), TU 111466 (4), UF 56066 (26), TU 46112 (8), UF 57297 (7), TU 113873 (4), and TU 129426 (4); TU 46398 (1), Turkey Cr., trib. to Shoal R., 1 mi W junction Fla Hwy 2A an US Hwy 331 (T4N, R20W, Sec 16), TU 46454 (3), and TU 67413 (2); UF 54134 (3), Long Cr., 10.3 mi S Clear Springs (T4N, R21W, Sec 21); UF 56225 (3), Big Swamp Cr. at US Hwy 331 at Liberty, 9.5 airmi NW De Funiak Springs (T4N, R20W, Sec 26); TU 24101 (2), Bottle Branch, trib. to Shoal R. (T3N, R21W, Sec 4); TU 24766 (4), Wolf Cr., trib. to Shoal R. (T3N, R21W, Sec 6). **Alabama**. COVINGTON COUNTY: TU 72895 (17), Yellow R. at Covington Co. Rd 4, 12 mi W Florala (T1N, R15E, Sec 34); TU 72974 (38), Yellow R., 9.4 mi NNW Florala, Covington Co. Rd 55 (T2N, R16E, Sec 34); TU 73017 (25), Five Runs Cr., trib. to Yellow R., 15 mi NW Florala (T2N, R15E, Sec 26); TU 73180 (5), Yellow R., 7 mi N Babbie (T5N, R17E, Sec 27); TU 73162 (12), Yellow R., 10 mi SW Opp (T3N, R17E, Sec 21); TU 82612 (3), Yellow R., 4.6 mi SE Wing at Covington Co. Rd 4 (T1N, R15E, Sec 34).

**Choctawhatchee River drainage,. Florida**. WALTON COUNTY: UF 54149 (2), Eight Mile Cr., 2.7 mi WNW Gaskin (T6N, R19W, Sec 31); UF 54228 (3), Natural Bridge Cr. at Natural Bridge, 4.5 mi WNW Gaskin (T6N, R20W, Sec 26). HOLMES COUNTY: TU 182 (2), Parrot Cr., trib. to Choctawhatchee R., 4.7 mi SSW Geneva, AL (T6N, R17W, Sec 25); TU 1587 (20), Mill Cr., trib. to Choctawhatchee R. at southern limits of Ponce de Leon (T3N, R17W, Sec 28); TU 2285 (4), Wrights Cr., 3.5 mi NW junction Fla Hwy 79 and Fla Hwy 177 at Hwy 177 (T4N, R15W, Sec 1), TU 45652 (1), and TU 46130 (3); TU 46268 (1), Wrights Cr., trib. to Choctawhatchee R., 6 mi S junction Fla Hwy 2 and Fla Hwy 79 at Hwy 79 (T5N, R14W, Sec 32), TU 46434 (6), and TU 46663 (1); UF 54128 (2), Wrights Cr., 6.1 mi W Graceville railroad station at Fla Hwy 2 (T7N, R14W, Sec 35), UMMZ 166309 (1); TU 2475 (3), Little Cr., trib. to Ten Mile Cr., 6.5 mi NNW junction Fla Hwy 79 and Fla Hwy 177 (T5N, R15W, Sec 27); UF 51645 (1), Ten Mile Cr., 7.0 mi NNE Bonifay at Fla Hwy 177 (T6N, R15W, Sec 35); UF 54409 (2), East Pittman Cr., 0.8 mi N Pittman (T5N, R16W, Sec 11). HOLMES-WASHINGTON COUNTY: UF 51250 (3), Holmes Cr., 4.6 mi W Chipley at US Hwy 90 (T4N, R14W, Sec 2). WASHINGTON COUNTY: UF 57945 (2), trib. to Holmes Cr., 6 airmi SW Chipley

at Washington Co. Hwy 280 (T4N, R14W, Sec 22). **Alabama**. GENEVA COUNTY: TU 2418 (2), Spring Cr., trib. to Choctawhatchee R., 1.8 mi N Black (T1N, R23E, Sec 27), and TU 16374 (10); TU 2516 (5), Panther Cr., trib. to Little Choctawhatchee R., 3 mi W Pinckard Farm Rd and US Hwy 84 (T3N, R25E, Sec 7). DALE COUNTY: AUM 27121 (2), Claybank Cr. at Ala Hwy 27 (T5N, R25E, Sec 2).

DIAGNOSIS: *Etheostoma colorosum* is a member of subgenus *Ulocentra* as diagnosed by Bouchard (1977) and Bailey and Etnier (1988). Further, *E. colorosum* lacks a premaxillary frenum and in this respect is typical of members of the *E. duryi* species group of Bailey and Etnier (1988). The vomer is feebly toothed or may lack teeth. *Etheostoma colorosum* lacks a red ocellus in the first membrane of the spinous dorsal fin, as do a few other *Ulocentra* species from the Gulf Coastal Plain. The unique diagnostic feature of *E. colorosum* is a series of small orange to red spots or punctulations along the side of the nuptial male. This series of punctulations extends from base of caudal anteriorly to above pectoral fin base and is immediately dorsal to the mid-lateral brown blotches that are usually centered on the lateral line. Most nuptial males have a few additional orange or red punctulations along the lateral line between the lateral blotches. The lateral blotches are of moderate size and are ovoid to quadrate in shape. The red coloration in the spinous dorsal fin is restricted to the posterior three to five interradial membranes and thus does not form a complete band across the fin. An incomplete band of black blotches extends from the first to the sixth or the seventh or eighth interradial membrane. The posterior black blotches occur on the fin proximally to the anteriormost red blotches. Both the spinous and the soft dorsal fins are noticeably elevated.

DESCRIPTION: *Etheostoma colorosum* reaches a maximum of 48 mm SL (females) to 58 mm SL (males). Sexual dimorphism and apparent sexual maturity occur at the end of the first year at a minimum of 28 mm SL (females) and 30 mm SL (males).

Frequency distributions of scale and fin ray counts are presented in Tables 1 and 2. Number of vertebrae, branchiostegal rays, gill rakers, and preoperculomandibular pores are given in Table 3. The lateral line is usually complete with (39–) 41–47 (–50) scales, occasionally the last scale is unpored. Transverse scales 10 (1 specimen), 11(48), 12(158), 13(158), 14(75), 15(18), or 16(4). Transverse scales from origin of second dorsal fin to anal fin (an alternative count, see Bailey and Etnier 1988: 30) 9(1), 10(11), 11(65), 12(30), 13(5); mean of 112 counts, 11.2. Caudal peduncle scale rows number 12(2), 13(11), 14(79), 15(274), 16(147), 17(50), or 18(6) in 569 specimens. Dorsal fin has (9–) 10–11 (–12) spines and (10–) 11–12 (–13) soft rays. Anal fin has 2 spines and (6–) 7–8 (–9), modally 7, soft rays. Pectoral fin has (13–) 14–15 (– 16) rays. Branchiostegal rays number 4—5(2), 5—5 (534), 5—6 (12), 6—5 (5), or 6—6 (6) in 559 specimens; vertebrae number 37(5), 38(104), 39(104), or 40(6), and gill rakers on first arch number 6(9), 7(53), 8(36), or 9(2). Number of vertebrae (Bailey and Gosline, 1955) and gill rakers are quite consistent within species groups. The sum of left and right preoperculomandibular pores is nearly constant at 18 (in 180 of 190 specimens), the remaining ten have 16, 17, or 19 pores. The opercle, cheek, nape, and prepectoral area typically are covered with exposed scales. The scales on the cheek usually are smaller than those on the opercle, and frequently there is a mixture of exposed and embedded scales. The belly varies from being completely covered with exposed scales to being naked on the anterior half. Females more frequently than males have the anterior part of the belly naked and in some of

Table 1. Frequency distribution of scale counts in *Etheostoma colorosum*, *E. bellator*, and *E. chermocki*.

| | Lateral-line scales | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species and drainage | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | N | x̄ | S.D. |
| *Etheostoma colorosum* | | | | | | | | | | | | | | | | | | | | |
| Perdido R. | | | 2 | 4 | 8 | 2 | 5 | 1 | 1 | | | | | | | | | 23 | 43.5 | 1.6 |
| Escambia R | | 4 | 16 | 29 | 47 | 50 | 37 | 23 | 6 | 3 | 2 | | | | | | | 217 | 43.8 | 1.7 |
| Blackwater R. | 1 | 4 | 14 | 22 | 26 | 34 | 15 | 12 | 8 | 2 | | | | | | | | 138 | 43.5 | 1.8 |
| Yellow R. | | 1 | 3 | 8 | 12 | 26 | 24 | 25 | 11 | 9 | 3 | 2 | | | | | | 124 | 45.0 | 1.9 |
| Choctawhatchee R. | 1 | - | 2 | 3 | 15 | 8 | 15 | 9 | 7 | 10 | 4 | | | | | | | 74 | 45.1 | 2.1 |
| *Etheostoma bellator* | | | | | | | | | | | | | | | | | | | | |
| Mulberry Fork | | | 2 | - | 1 | 3 | 15 | 32 | 33 | 40 | 47 | 26 | 8 | 5 | 1 | | | 213 | 47.9 | 1.9 |
| Valley Cr. | | | | | 1 | 1 | 3 | 8 | 17 | 12 | 17 | 15 | 14 | 5 | 4 | 2 | 1 | 100 | 49.0 | 2.3 |
| *Etheostoma chermocki* | | | | | | | | | | | | | | | | | | | | |
| Turkey Cr. | | | | | 4 | 5 | 3 | 12 | 17 | 6 | 11 | 7 | 3 | 2 | - | 1 | | 71 | 47.4 | 2.3 |

| | Scales around caudal peduncle | | | | | | | | | | | | | Transverse scale rows | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | N | x̄ | S.D. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | N | x̄ | S.D. |
| *Etheostoma colorosum* | | | | | | | | | | | | | | | | | | | | | | | |
| Perdido R. | | | 6 | 10 | 5 | 1 | 1 | | | | 23 | 15.2 | 1.0 | | 6 | 8 | 7 | 2 | | | 23 | 12.2 | 0.9 |
| Escambia R. | 1 | 5 | 37 | 112 | 52 | 6 | | | | | 213 | 15.1 | 0.8 | | 20 | 67 | 54 | 13 | 2 | | 156 | 12.4 | 0.9 |
| Blackwater R. | 1 | 6 | 27 | 84 | 16 | 2 | | | | | 136 | 14.8 | 0.7 | 1 | 17 | 42 | 28 | 11 | 1 | | 100 | 12.3 | 0.9 |
| Yellow R. | | | 6 | 43 | 48 | 24 | 2 | | | | 123 | 15.8 | 0.8 | | 5 | 18 | 49 | 30 | 6 | 2 | 110 | 13.2 | 1.0 |
| Choctawhatchee R. | | | 3 | 25 | 26 | 17 | 3 | | | | 74 | 15.9 | 0.9 | | | 23 | 20 | 19 | 9 | 2 | 73 | 13.3 | 1.1 |
| *Etheostoma bellator* | | | | | | | | | | | | | | | | | | | | | | | |
| Mulberry Fork | | | | 3 | 13 | 114 | 44 | 38 | 1 | 1 | 214 | 17.5 | 0.9 | | | 3 | 27 | 60 | 38 | 12 | 140 | 14.2 | 0.9 |
| Valley Cr. | | | | 1 | 6 | 55 | 21 | 17 | | | 100 | 17.5 | 0.9 | | | | 15 | 46 | 35 | 4 | 100 | 14.3 | 0.8 |
| *Etheostoma chermocki* | | | | | | | | | | | | | | | | | | | | | | | |
| Turkey Cr. | | | | | 8 | 30 | 20 | 10 | 2 | 1 | 71 | 17.6 | 1.0 | | | | 2 | 45 | 20 | 4 | 71 | 14.4 | 0.6 |

TABLE 2. Frequency distribution of fin ray counts in *Etheostoma colorosum*, *E. bellator*, and *E. chermocki*.

| Species and drainage | Dorsal spines | | | | N | x̄ | S.D. | Dorsal soft rays | | | | | N | x̄ | S.D. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 10 | 11 | 12 | | | | 9 | 10 | 11 | 12 | 13 | | | |
| *Etheostoma colorosum* | | | | | | | | | | | | | | | |
| Perdido R. | 3 | 14 | 6 | | 23 | 10.1 | 0.6 | | | 11 | 11 | 1 | 23 | 11.6 | 0.6 |
| Escambia R. | 4 | 129 | 80 | 2 | 215 | 10.3 | 0.8 | | 39 | 104 | 70 | 2 | 215 | 11.2 | 0.7 |
| Blackwater R. | | 38 | 95 | 5 | 138 | 10.8 | 0.5 | | 1 | 55 | 80 | 2 | 138 | 11.6 | 0.5 |
| Yellow R. | 6 | 53 | 63 | 2 | 124 | 10.5 | 0.6 | | | 43 | 78 | 3 | 124 | 11.7 | 0.5 |
| Choctawhatchee R. | 1 | 40 | 32 | 1 | 74 | 10.4 | 0.5 | | 2 | 45 | 26 | 1 | 74 | 11.3 | 0.5 |
| *Etheostoma bellator* | | | | | | | | | | | | | | | |
| Mulberry Fork | 13 | 101 | 47 | | 161 | 10.2 | 0.5 | | 12 | 121 | 28 | | 161 | 11.1 | 0.4 |
| Valley Cr. | | 44 | 56 | | 100 | 10.6 | 0.5 | 1 | 10 | 72 | 17 | | 100 | 11.0 | 0.5 |
| *Etheostoma chermocki* | | | | | | | | | | | | | | | |
| Turkey Cr. | | 21 | 47 | 3 | 71 | 10.7 | 0.5 | | 11 | 52 | 8 | | 71 | 10.9 | 0.5 |

| | Anal soft rays | | | | | N | x̄ | S.D. | Left pectoral rays | | | | N | x̄ | S.D. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | | | | 13 | 14 | 15 | 16 | | | |
| *Etheostoma colorosum* | | | | | | | | | | | | | | | |
| Perdido R. | | | 18 | 5 | | 23 | 7.2 | 0.4 | | 15 | 8 | | 23 | 14.3 | 0.5 |
| Escambia R. | | 10 | 148 | 36 | | 194 | 7.1 | 0.4 | 7 | 133 | 74 | | 214 | 14.3 | 0.5 |
| Blackwater R. | | 2 | 66 | 70 | | 138 | 7.5 | 0.5 | | 44 | 91 | 3 | 138 | 14.7 | 0.5 |
| Yellow R. | | | 68 | 52 | 4 | 124 | 7.5 | 0.5 | | 46 | 77 | 1 | 124 | 14.6 | 0.4 |
| Choctawhatchee R. | | | 47 | 27 | | 74 | 7.4 | 0.4 | | 40 | 33 | 1 | 74 | 14.5 | 0.5 |
| *Etheostoma bellator* | | | | | | | | | | | | | | | |
| Mulberry Fork | | 40 | 117 | 4 | | 161 | 6.8 | 0.4 | 15 | 168 | 33 | | 216* | 14.1 | 0.4 |
| Valley Cr. | | 11 | 75 | 14 | | 100 | 7.0 | 0.5 | 39 | 61 | | | 100 | 13.6 | 0.5 |
| *Etheostoma chermocki* | | | | | | | | | | | | | | | |
| Turkey Cr. | 1 | 4 | 47 | 19 | | 71 | 7.2 | 0.6 | 27 | 44 | | | 71 | 13.6 | 0.5 |

*one of 217 specimens with 9 pectoral rays

TABLE 3. Frequency distribution of numbers of vertebrae, branchiostegal rays, gill rakers, and preoperculomandibular pores in *Etheostoma colorosum*, *E. bellator*, and *E. chermocki*.

| | Vertebrae | | | | | | | Branchiostegal rays | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species and drainage | 37 | 38 | 39 | 40 | N | x̄ | S.D. | 4–5 | 5–5 | 5–6 | 6–5 | 6–6 | N |
| *Etheostoma colorosum* | | | | | | | | | | | | | |
| Perdido R. | | | | | 0 | | | | 22 | 1 | | | 23 |
| Escambia R. | 1 | 4 | | | 5 | 37.8 | 0.4 | 1 | 194 | 3 | 1 | 1 | 200 |
| Blackwater R. | 1 | 39 | 51 | 4 | 95 | 38.6 | 0.5 | | 135 | 1 | 1 | 1 | 138 |
| Yellow R. | | 47 | 50 | 2 | 99 | 38.5 | 0.5 | | 113 | 5 | 2 | 4 | 124 |
| Choctawhatchee R. | 3 | 14 | 3 | | 20 | 38.0 | 0.5 | 1 | 70 | 2 | 1 | | 74 |
| TOTAL | | | | | 219 | 38.5 | 0.5 | | | | | | 559 |
| *Etheostoma bellator* | | | | | | | | | | | | | |
| Mulberry Fork | 1 | 54 | 8 | | 63 | | | | 190 | 1 | 5 | 6 | 202 |
| Valley Cr. | | 3 | 1 | | 4 | | | | 100 | | | | 100 |
| TOTAL | | | | | 67 | 38.1 | 0.4 | | | | | | 302 |
| *Etheostoma chermocki* | | | | | | | | | | | | | |
| Turkey Cr. | | 19 | 4 | | 23 | 38.2 | 0.4 | | 71 | | | | 71 |

| | Gill rakers | | | | | | | | Preoperculomandibular pores | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 7 | 8 | 9 | 10 | N | x̄ | S.D. | 16 | 17 | 18 | 19 | N | x̄ | S.D. |
| *Etheostoma colorosum* | | | | | | | | | | | | | | | |
| Escambia R. | | 5 | 4 | 1 | | 10 | 6.6 | 0.6 | 1 | 3 | 54 | | 58 | 17.9 | 0.3 |
| Blackwater R. | 6 | 32 | 17 | | | 55 | 7.2 | 0.6 | | 2 | 84 | 1 | 87 | 17.9 | 0.1 |
| Yellow R. | 1 | 7 | 7 | | | 15 | 7.4 | 0.6 | | 1 | 33 | | 34 | 17.9 | 0.1 |
| Choctawhatchee | 2 | 9 | 8 | 1 | | 20 | 7.4 | 0.6 | | 2 | 9 | | 11 | 17.7 | 0.4 |
| TOTAL | | | | | | 100 | 7.3 | 0.7 | | | | | 190 | 17.9 | 0.2 |
| *Etheostoma bellator* | | | | | | | | | | | | | | | |
| Mulberry Fork | | 6 | 27 | 20 | 2 | 55 | 8.3 | 0.7 | | 5 | 124 | 3 | 132 | 17.9 | 0.2 |
| Valley Cr. | | | 8 | 7 | | 15 | 8.5 | 0.5 | | | | | | | |
| TOTAL | | | | | | 70 | 8.3 | 0.7 | | | | | | | |
| *Etheostoma chermocki* | | | | | | | | | | | | | | | |
| Turkey Cr. | | | 2 | 8 | | 10 | 8.8 | 0.4 | | 1 | 9 | | 10 | 17.9 | 0.3 |

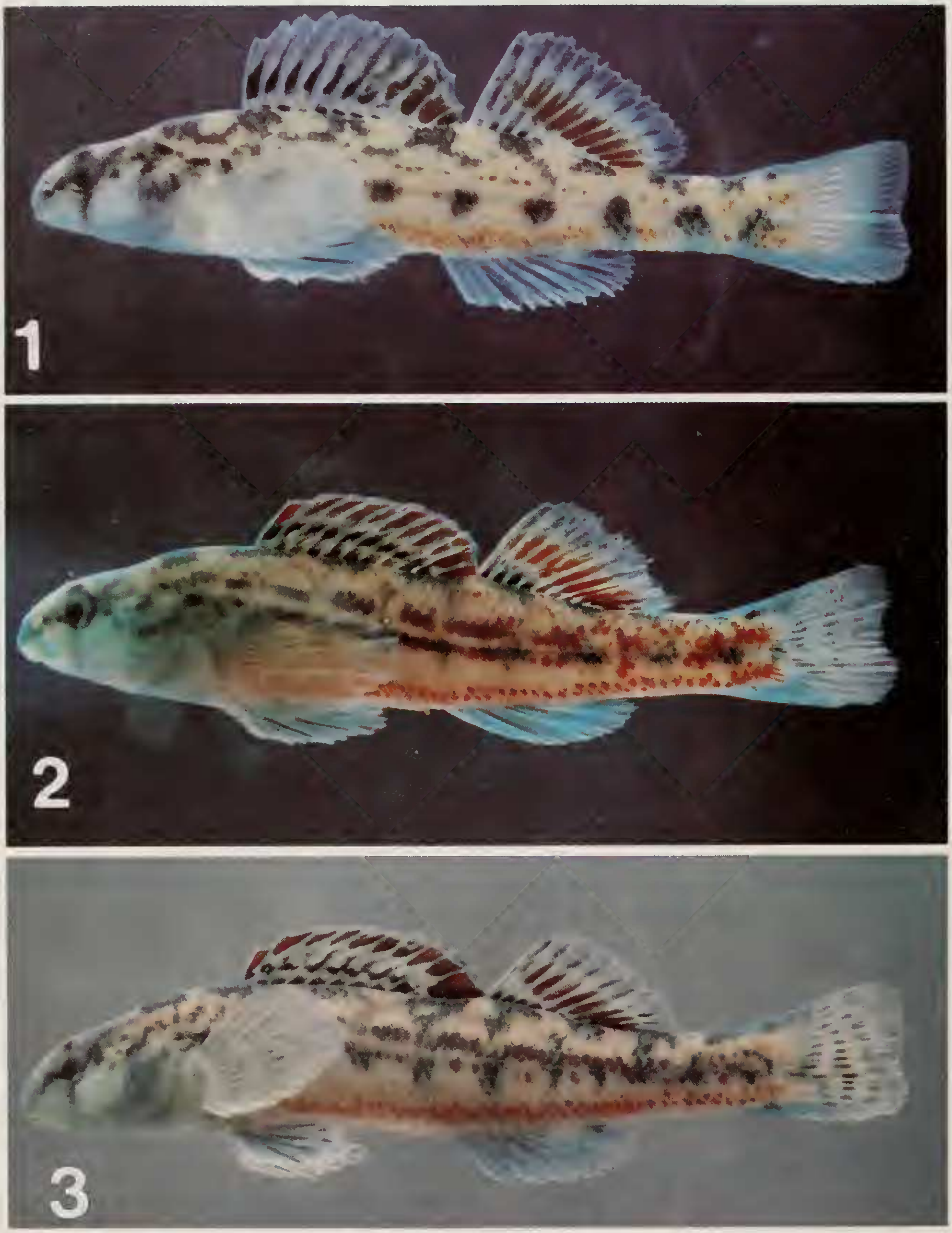
these individuals the scales diminish in size anteriorly and may be partially embedded. The breast is consistently scaleless.

In 10 specimens dissected, the vomer is toothless in four, has a single weak tooth in four, and has two small teeth in two; the palatines are uniformly toothless.

Proportional measurements appear in Tables 4 and 5. Twenty of the 25 males were nuptial specimens taken between the 2nd and the 21st of March. The remainder of the specimens came from a November collection. The two lots of five each of females were taken from a March 21 and an April 8 collection.

Colors of live and freshly preserved nuptial specimens, collected in March and April, are described from Pine Barren Creek of the Escambia R. drainage (Figure 1) and Bear, Sweetwater, and Big Juniper creeks of the Blackwater R. drainage. Nuptial males have an orange stripe on the lower side. This orange stripe usually narrows posteriorly and is partially obliterated by an overlay of turquoise color immediately ventral to the last three lateral blotches. The turquoise extends from the ventral edge of a lateral blotch on one side of the body to the ventral edge of the corresponding blotch on the opposite side. The lateral body blotches are dark brown, oval to rounded quadrate in shape and number seven to nine. These blotches are centered along the lateral line or quite frequently extend farther below the lateral line than above it. One of the diagnostic color features of *Etheostoma colorosum* is the "string" of orange to red-orange small spots that extends along the side above the brown lateral blotches. This series of spots or punctulations extends from the base of the caudal fin anteriorly to the shoulder region just above the base of the pectoral fin. The spots are arranged in linear groups of two to four (or five) closely spaced spots, and the groups are separated by somewhat wider interspaces. Most nuptial males have additional orange spots along the lateral line between the brown lateral blotches. The number of spots between the blotches is usually one or two, or occasionally three. There are some irregularly shaped brown blotches (more linear than the lateral blotches) on the dorsal-lateral area of the body. The upper edges of some of these are connected with the median dorsal blotches (typically eight in number). The blotch on the nape, and the dorsal blotches 7 and 8 on the caudal peduncle, are overlaid with turquoise color. The top of the head is dark brown. The ventral surface of the head from the breast to the anterior tip is pale with an overlay of turquoise color. The entire breast, gill membranes, lower part of opercle, cheek, and side of snout are turquoise in color. There is a dark brown preorbital bar, a dark brown suborbital bar, and several brown blotches along upper margin of the opercle. The iris is dark with a golden edging around pupil.

The pectoral fins are the only ones that lack turquoise in the nuptial male. The pelvic fins and all the median fins have some turquoise coloration. The pectoral fins appear to be clear to the unaided eye, however, magnification reveals considerable dark pigmentation along the rays and that only the interradial membranes are clear. Nearly the entire anal and pelvic fins are turquoise. The tips of the spines and soft rays of anal and pelvic fins are milky white. After the blue color has faded, both the fin rays and the interradial membranes are found to be densely pigmented with melanophores. The margins of the caudal, first and second dorsal fins are turquoise. Some males at the peak of nuptial coloration have more than half the caudal fin turquoise. There are two orange to red-orange blotches at the base of the caudal fin and, immediately posterior, a small central pale area. The rest of the caudal fin is turquoise with the more intense coloration along lower and upper procurrent margins. The marginal and submarginal areas of the spinous dorsal fin are turquoise. Proximally from




Figures 1—3. *Etheostoma* species from Alabama and Florida. 1. *E. colorosum*, TU 162508, holotype, adult male, 50 mm SL. Pine Barren Cr., trib. to Escambia R., Escambia Co., FL (photo by R. D. Suttkus). 2. *E. bellator*, TU 151837, paratype, adult male, 43 mm SL. Murphy Cr. along US Hwy 31, 2.0 mi SW Blount Springs, Blount Co., AL (photo by J. M. Pierson). 3. *E. bellator*, TU 163053, paratype, adult male, 48 mm SL. Murphy and Mill Cr. confluence, 1 mi SW Blount Springs, Blount Co., AL (photo by R. D. Suttkus).

Figures 4—7. *Etheostoma* species from Alabama. 4. *E. bellator*, TU 163053, paratype, adult male, 46 mm SL. Murphy and Mill Cr. confluence, 1 mi SW Blount Springs, Blount Co., AL. 5. *E. bellator*, TU 163017, adult male, 39 mm SL. Fivemile Cr. at McCalla, Jefferson Co., AL. 6. *E. chermocki*, TU 163026, adult male, 57 mm SL. Trib. to Turkey Cr. near Ala Hwy 79, 1 mi N Pinson, Jefferson Co., AL, 28 April 1992. 7. *E. chermocki*, TU 163045, adult male, 48 mm SL. Turkey Cr. at Ala Hwy 75, 1 mi N Pinson, Jefferson Co., AL, 28 April 1992. Photos by R. D. Suttkus.

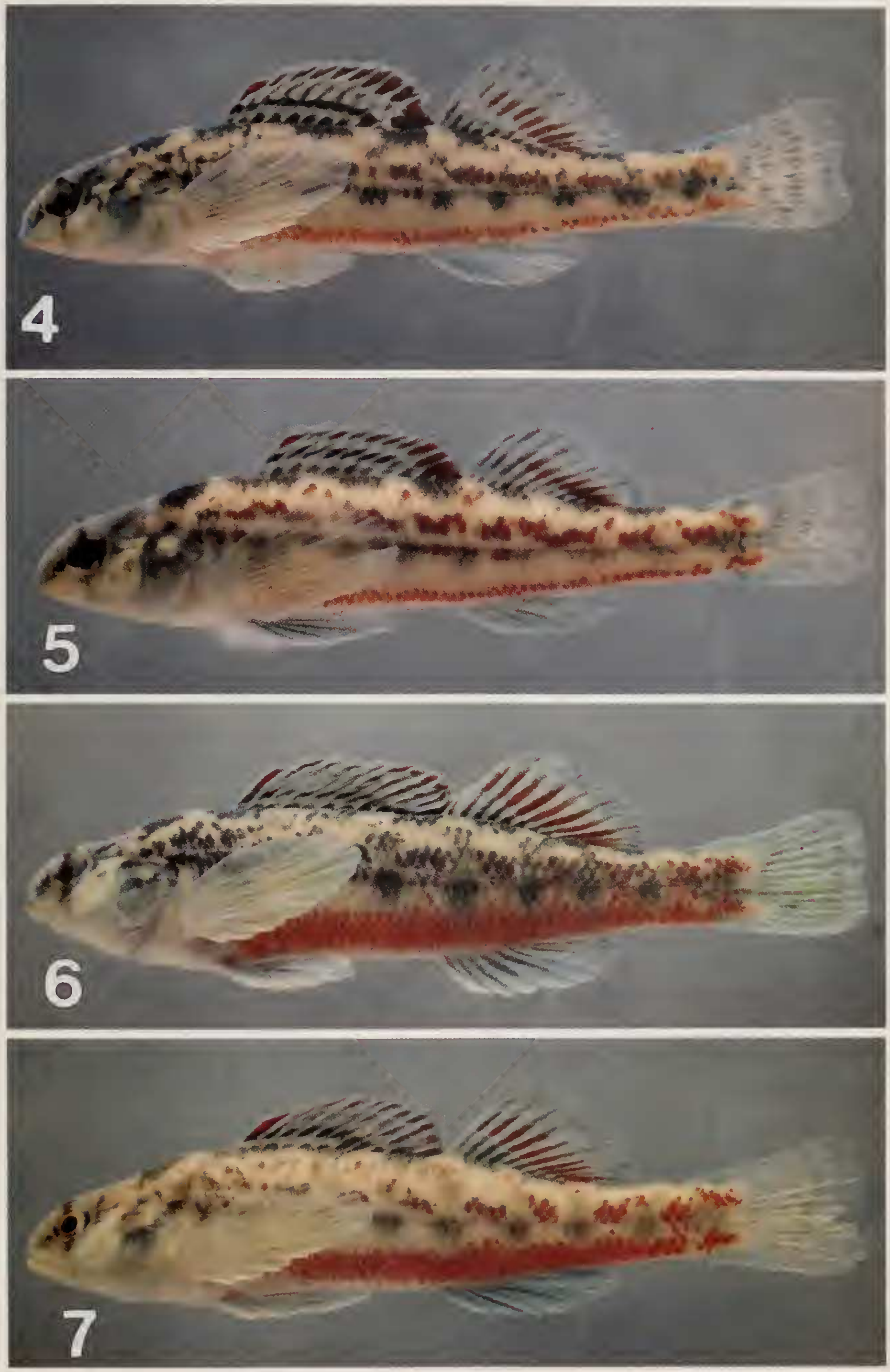

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5
6
7

TABLE 4. Measurements in thousandths of standard length for *Etheostoma colorosum*, *E. bellator*, and *E. chermocki* males.

| | *E. colorosum* (N = 25) | | | *E. bellator* (N = 25) | | | *E. chermocki* (N = 8) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Range | x̄ | S.D. | Range | x̄ | S.D. | Range | x̄ | S.D. |
| Standard length (mm) | 40.6—53.5 | 47.9 | 3.5 | 43.3—57.8 | 49.0 | 3.9 | 40.8—56.4 | 43.3 | 5.8 |
| Head length | 242—272 | 257 | 8.3 | 246—278 | 259 | 8.3 | 237—264 | 255 | 8.1 |
| Body depth at dorsal origin | 177—224 | 194 | 9.8 | 191—241 | 219 | 12.8 | 206—234 | 221 | 10.2 |
| Snout length | 66—81 | 73 | 3.3 | 66—78 | 72 | 3.2 | 64—72 | 68 | 2.8 |
| Orbit length | 63—75 | 68 | 2.8 | 60—73 | 66 | 3.4 | 55—65 | 62 | 3.1 |
| Spinous dorsal fin length | 273—319 | 300 | 12.3 | 287—327 | 309 | 12.1 | 286—333 | 313 | 15.5 |
| Longest dorsal spine | 133—182 | 154 | 11.1 | 116—149 | 127 | 8.0 | 131—156 | 142 | 9.9 |
| Soft dorsal fin length | 281—338 | 308 | 16.1 | 252—320 | 276 | 14.7 | 253—303 | 276 | 16.0 |
| Longest dorsal soft ray | 150—191 | 166 | 10.9 | 137—178 | 154 | 8.7 | 150—177 | 163 | 8.9 |
| Caudal peduncle length | 291—317 | 305 | 7.2 | 270—313 | 290 | 10.8 | 264—279 | 270 | 5.4 |
| Caudal peduncle depth | 92—112 | 98 | 5.0 | 105—128 | 114 | 4.9 | 108—120 | 112 | 4.0 |
| Anal fin length | 264—307 | 280 | 10.5 | 231—280 | 260 | 12.8 | 257—281 | 269 | 7.8 |
| First anal spine length | 50—91 | 72 | 8.5 | 68—97 | 82 | 7.3 | 76—91 | 84 | 5.3 |
| Longest anal soft ray | 134—168 | 146 | 8.0 | 131—160 | 148 | 8.0 | 135—166 | 148 | 9.1 |
| Caudal fin length | 210—245 | 228 | 9.6 | 183—230 | 213 | 8.7 | 206—242 | 225 | 12.7 |
| Pectoral fin length | 260—343 | 290 | 18.7 | 247—298 | 273 | 15.5 | 251—287 | 271 | 12.3 |
| Pelvic fin length | 200—250 | 221 | 11.6 | 195—242 | 221 | 12.5 | 198—231 | 216 | 11.8 |
| Trans-pelvic width | 77—93 | 84 | 4.1 | 78—90 | 83 | 3.1 | 75—86 | 81 | 3.5 |
| Maximum body width | 123—156 | 137 | 7.2 | 122—159 | 141 | 10.3 | 124—143 | 133 | 7.0 |
| Interorbital width | 39—50 | 44 | 2.7 | 43—55 | 49 | 3.0 | 46—51 | 47 | 1.8 |

TABLE 5. Measurements in thousandths of standard length for *Etheostoma colorosum*, *E. bellator*, and *E. chermocki* females.

| | *E. colorosum* (N = 10) | | | *E. bellator* (N = 10) | | | *E. chermocki* (N = 10) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Range | x̄ | S.D. | Range | x̄ | S.D. | Range | x̄ | S.D. |
| Standard length (mm) | 38.6—47.1 | 43.4 | 2.5 | 41.9—46.9 | 43.8 | 1.5 | 42.1—49.0 | 46.2 | 2.3 |
| Head length | 238—267 | 255 | 9.3 | 245—270 | 258 | 7.3 | 235—268 | 246 | 9.7 |
| Body depth at dorsal origin | 181—224 | 199 | 16.6 | 221—261 | 241 | 14.4 | 228—269 | 241 | 13.6 |
| Snout length | 63—76 | 71 | 3.6 | 67—74 | 70 | 2.2 | 59—69 | 62 | 3.5 |
| Orbit length | 71—83 | 74 | 3.7 | 67—76 | 71 | 2.7 | 61—69 | 65 | 2.5 |
| Spinous dorsal fin length | 265—302 | 280 | 12.6 | 268—311 | 286 | 12.8 | 285—310 | 297 | 6.9 |
| Longest dorsal spine | 107—130 | 116 | 6.9 | 96—120 | 108 | 7.8 | 103—131 | 119 | 8.3 |
| Soft dorsal fin length | 269—307 | 286 | 11.8 | 245—266 | 256 | 7.3 | 256—288 | 270 | 10.3 |
| Longest dorsal soft ray | 142—158 | 151 | 5.1 | 131—153 | 141 | 9.2 | 137—158 | 147 | 6.7 |
| Caudal peduncle length | 280—314 | 293 | 10.0 | 264—290 | 279 | 8.8 | 263—294 | 276 | 8.1 |
| Caudal peduncle depth | 84—101 | 91 | 6.0 | 103—118 | 108 | 4.5 | 96—112 | 106 | 4.2 |
| Anal fin length | 232—272 | 248 | 13.6 | 231—260 | 247 | 9.0 | 233—265 | 248 | 9.5 |
| First anal spine length | 54—68 | 60 | 4.2 | 65—86 | 76 | 7.1 | 59—91 | 72 | 9.6 |
| Longest anal soft ray | 116—140 | 128 | 8.1 | 136—152 | 143 | 4.8 | 120—149 | 138 | 9.5 |
| Caudal fin length | 213—241 | 222 | 9.6 | 201—224 | 213 | 8.1 | 211—240 | 222 | 9.0 |
| Pectoral fin length | 261—331 | 294 | 18.6 | 255—300 | 279 | 13.3 | 244—317 | 284 | 18.6 |
| Pelvic fin length | 197—242 | 209 | 13.1 | 196—226 | 213 | 9.8 | 192—222 | 204 | 10.9 |
| Trans-pelvic width | 77—83 | 80 | 2.1 | 77—85 | 81 | 2.5 | 74—83 | 78 | 2.8 |
| Maximum body width | 130—159 | 143 | 8.8 | 164—205 | 180 | 13.4 | 145—229 | 168 | 24.9 |
| Interorbital width | 39—47 | 44 | 2.6 | 47—57 | 51 | 2.6 | 38—50 | 43 | 3.4 |


8


9


10


11

the turquoise there are two distinct patterns of color. Posteriorly in the mid-portion of the fin there is a series of red blotches that cover most of the interradial membranous areas in the posterior part of the fin but diminish abruptly in size in the successive membranes anteriorly. The number of red blotches varies from three to six; each is margined or haloed with mixtures of white, cream or yellow. The other pattern of color is a series or row of black blotches that extend from the first interradial membrane to the seventh or eighth. These black blotches occur in the basal half of each interradial membrane. There is a slight distal arching of the blotches. Small nuptial males usually have fewer black blotches. The anterior blotch is typically well developed whereas the posterior ones are diminished in size and intensity of pigmentation. The posterior one or two black blotches are proximal to the anterior one or two red blotches (Figure 1). Proximal to the lower ends of the black blotches there is a pale area and beneath that is a series of small black blotches at the base of the fin. These small blotches also are centered on the interradial membranes.

The second dorsal fin has a moderately broad margin of turquoise. Across the middle of the fin is a diagonal band of red color that tapers in width at either end. The red blotches that form the band are located on the interradial membranes. The red band quite frequently does not extend anteriorly to the first or anteriormost interradial area. The next more proximal series (black blotches) is greatly reduced in comparison to that described for the spinous dorsal. The series in the second dorsal is reduced to two to four black blotches. The posterior one to three black blotches are immediately proximal to the anteriormost red blotches described above. There are a few small black blotches at the base of the fin that are similar to those described for the spinous dorsal. The black blotches and the melanophores underlying the turquoise, red, and orange-colored areas remain distinct for a long time in preservative, long after the turquoise, red, and orange coloration has faded.

Nuptial females have some bright coloration although greatly reduced in coverage compared to the nuptial male. The red blotches in the central posterior part of the spinous dorsal are small and number three or four. There are four to six small faint red blotches in a diagonal band across the second dorsal fin. There are a few orange flecks and spots on the body but these spots are scattered and do not form a continuous series as described for the nuptial males. The lower of the two basal caudal orange blotches is present in some females. The spinous rays in the first dorsal and the soft rays in the second dorsal fin are checkered with golden and dusky coloration. There are three or four golden spots along each soft ray. The golden areas alternate with dusky areas along the rays producing a checkered pattern. There is also a row of golden spots, each of which is centered on the interradial membrane along the base of the spinous dorsal fin. The blotches on the upper part of the body, on the top of the head and on the dorsum of the body are pale to medium brown. Those on the upper side are pale brown whereas most of the dorsal blotches are medium brown. The lateral blotches (usually eight) are dark brown and are centered below the

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Figures 8—11. *Etheostoma* species from Alabama and Florida. 8. *E. colorosum*, TU 162509, paratype, adult female, 44 mm SL. Pine Barren Cr. at Still Road, Escambia Co., FL. 9. *E. bellator*, TU 163053, paratype, adult female, 43 mm SL. Murphy and Mill Cr. confluence, 1 mi SW Blount Springs, Blount Co., AL. 10. *E. bellator*, TU 163017, adult female, 37 mm SL. Fivemile Cr. at McCalla, Jefferson Co., AL. 11. *E. chermocki*, TU 163027, adult female, 48 mm SL. Trib. to Turkey Cr. near Ala Hwy 79, 1 mi N Pinson, Jefferson Co., AL, 28 April 1992. Photos by R. D. Suttkus.

lateral line. Most of the ventral lateral area below the lateral blotches is immaculate, except for a few scattered flecks of color. The pectoral and caudal fin rays have dusky and pale areas along their lengths and collectively the dusky areas form wavy vertical bars. There is some yellow along the rays of pectoral, pelvic, and caudal fins. There is a faint wash of turquoise on the anal fin and along upper and lower procurrent margins of the caudal fin. There is a brown prepectoral blotch, a brown suborbital and preorbital bar, and these brown blotches contrast with the pale ventral parts of the head and breast.

DISTRIBUTION: *Etheostoma colorosum* is confined to the coastal drainages of southern Alabama and the western part of the panhandle of Florida (Figure 12). One site is known in the Perdido River drainage and numerous sites to the east in the Escambia R., Blackwater R., Yellow R., and Choctawhatchee R. drainages. The species is not known to occur in the tidal areas around the heads of Perdido, Escambia, Blackwater, and Choctawhatchee Bays. Kuehne and Barbour's (1983) distribution map (page 97) of the "Gulfcoast Snubnose Darter" includes additional species in the Alabama and Tombigbee River drainages, and Page and Burr's (1991) map for their "Coastal Plain Darter" also represents a complex of species and does not include the Choctawhatchee River drainage (see page 302, map 346). Page's (1983) plate 16G of the "Coastal Plain darter" and Page and Burr's (1991) plate 43, bottom, of the "Coastal Plain Darter" are not referable to *Etheostoma colorosum*. No other species of subgenus *Ulocentra* occurs within the range of *E. colorosum*.

HABITAT AND BIOLOGY: In general the description of the habitat by Kuehne and Barbour (1983) for the "Gulfcoast Snubnose Darter" and that by Page and Burr (1991) for the "Coastal Plain Darter" apply to the habitat of *E. colorosum*. In addition to the sand and gravel substrates mentioned by the above authors, there are a few sections of hard clay, limestone, or sandstone in the Blackwater River drainage of Florida and in the upper reaches of the Escambia and Yellow River dainages in Alabama that apparently serve as suitable habitats, especially where there are some nearby patches of sand or gravel or rooted aquatic plants.

Based on recent collections, spawning occurs from early March to late April. Some late April collections indicated the near end to spawning or included a mixture of spent and nearspent individuals. The sex ratio is skewed toward more females. Based on five collections of types (holotype, four series of paratopotypes, and one series of paratypes from Pine Cr. at Fla. Hwy 99) taken over several years (1988-1992) in March and April, the 163 specimens include 58 (35.6%) males and 105 (64.4%) females. In one collection of 116 specimens taken on 8 March 1969 from Bear Cr., trib. to Sweetwater Cr. (Blackwater R. drainage) there are 47 (40.5%) males versus 69 (59.5%) females. The 58 males in the five type series range from 33.7 to 54.2 mm SL with a mean of 43.7 mm; the 105 females in the same five series range from 31.2 to 48.1 mm, mean 39.1 mm. The 47 males in the series from Bear Cr. range from 30.1 to 53.2 mm, mean 39.1 mm; the 69 females from 28.2 to 40.4 mm, mean 34.2 mm.

The species associates of *Etheostoma colorosum* at the Still Rd and at the Fla Hwy 99 sites in the five collections of types, are as follows: *Ichthyomyzon gagei, Erimyzon tenuis, Minytrema melanops, Moxostoma poecilurum, Cyprinella venusta, Notemigonus crysoleucas, Notropis buccatus, N. hypselopterus, N. signipinnis, N. texanus, N. welaka, Opsopoeodus emiliae, Semotilus thoreauianus, Noturus leptacanthus, Fundulus*

*olivaceus, Gambusia holbrooki, Aphredoderus sayanus, Ambloplites ariommus, Lepomis macrochirus, L. megalotis, L. punctatus, Micropterus salmoides, Etheostoma davisoni, E. edwini*, and *Percina nigrofasciata*.

VARIATION: Counts of lateral-line scales, scales around caudal peduncle, and transverse scale rows average higher in the Yellow and Choctawhatchee River drainages than in the three drainages to the west (Table 1). Variation in fin-ray counts is considerably less than in scale counts. Fin-ray counts are slightly higher in the three eastern drainages (Blackwater, Yellow, and Choctawhatchee) than in the Perdido and Escambia River drainages (Table 2).

COMPARISONS: *Etheostoma colorosum* males differ notably from *E. bellator* males in that they lack a red ocellus in the first membrane of the spinous dorsal fin; red coloration is restricted to the last few membranes in the spinous dorsal fin whereas the red forms a submarginal band across the entire fin in *E. bellator*. *Etheostoma colorosum* males (Figure 1) have an incomplete series of black blotches covering the lower one-third to one-half of the anterior membranes of the spinous dorsal fin whereas *E. bellator* males have a more complete narrow band of black across the lower part of the fin (Figures 2-5).

*Etheostoma colorosum* has lower scale counts (lateral-line, scales around caudal peduncle, transverse scale rows), and lower gill raker counts than does *E. bellator* (Tables 1, 3).

In general *E. colorosum* is more slender than *E. bellator*. This body shape is best shown by comparison of body depth versus body length and caudal peduncle depth versus caudal peduncle length. Also *E. colorosum* has longer soft dorsal, caudal, and pectoral fins in both sexes than does *E. bellator* (Tables 4, 5), but the anal fin is appreciably longer only in males. The spinous and soft dorsal fins are higher in *E. colorosum* than in *E. bellator* in males and females, but the first anal spine in *E. bellator* is longer than that of *E. colorosum* in both sexes.

Based on the similarity of the coloration of the spinous dorsal fin of males, *Etheostoma colorosum* is more similar to *E. tallapoosae* than to any other described member of subgenus *Ulocentra*. Both species lack a red ocellus in the first membrane and both have the red coloration restricted to the posterior membranes (Figure 1; Suttkus and Etnier, 1991: Figure 1). The red coloration is more extensive in *E. tallapoosae* than in *E. colorosum* and this red coloration shades into brown anteriorly. Together the red and the brown form a broad, more or less pronounced band, whereas in *E. colorosum* the red coloration ends abruptly and is replaced in part by black blotches that extend distally in each of the anterior membranes (Figure 1). The small orange to red spots or punctulations described in the diagnosis are unique to *E. colorosum*. The lateral blotches are smaller in *E. colorosum* than in *E. tallapoosae*.

There are some differences in the morphometrics of the two species. Based on 25 males of each species, the soft dorsal fin length and the longest dorsal soft ray show no overlap (Table 6). Proportional measurements of soft dorsal fin length are 281–338 ($\bar{x}$ = 308) in *E. colorosum* and 242–276 ($\bar{x}$ = 260) in *E. tallapoosae*. Measurements of longest dorsal soft ray are 150–191 ($\bar{x}$ = 166) in *E. colorosum* and 114–146 ($\bar{x}$ = 134) in *E. tallapoosae*. In addition, *E. colorosum* has longer caudal, pectoral, and anal fins; the longest dorsal spine and longest anal soft ray average is greater in *E. colorosum* than in *E. tallapoosae* (Table 6). Thus, the fins are longer and more elevated in *E. colorosum* than in *E. tallapoosae*.

ETYMOLOGY: The name *colorosum*, a Latin adjective in neuter form, is from *color*, color, and *-osus*, denoting usually fullness or abundance of, in reference to the high color especially of nuptial males. We recommend the vernacular name coastal darter in allusion to the coastwise distribution.

## **Etheostoma bellator**, new species
Warrior Darter
Figures 2-5, 9-10, 13

*Etheostoma (Ulocentra)* sp. Smith-Vaniz, 1968: 136 (Black Warrior R.). Dycus and Howell, 1974: 23, 27 (Black Warrior R. system records). Jenkins, 1976 (undescribed species, distribution).
Warrior darter. Page, 1983: *pl. 16C, 16D*. Page and Burr, 1991: 303, *pl. 43, map 346*.
*Etheostoma* sp. B. Mettee, 1978: 149 (habitat, distribution). Mettee, et al. 1989a: 71-76, 189, map (distribution, species associates, habitat). Mettee, et al. 1989b: 153 (distribution).
*Etheostoma* sp. Warrior snubnose darter. Boschung, et al. 1992: *fig. 1, C* and *D*; 15-20 (morphometric data, counts, descriptive comparisons, localities).

HOLOTYPE: Adult male, TU 162448, 44.0 mm standard length, Murphy Creek along US Hwy 31, 2.0 miles SW Blount Springs (T13S, R3W, Sec 14), Mulberry Fork to Black Warrior River system; Blount County, Alabama, 17 April 1988, R. D. Suttkus, M. F. Mettee, P. E. O'Neil, and J. M. Pierson.

PARATOPOTYPES: TU 151837 (76, 25–49), collected with holotype are distributed as follows: TU 151837 (70), UMMZ 221367 (6); TU 162671 (4, 34–43), Murphy Cr. along US Hwy 31, 1.6 mi SW Blount Springs (T13S, R3W, Sec 11), 9 April 1992, Blount Co., AL; TU 62656 (73, 23–58), Murphy Cr. at confluence with Mill Cr. along US Hwy 31, 1 mi SW Blount Springs (T13S, R3W, Sec 12), 19 December 1969, TU 77091 (179, 27–54), 4 April 1972, distributed as follows: TU 77091 (155), ANSP 169685 (2), CU 73645 (2), UAIC 10507.01 (4), UF 92634 (4), UMMZ 221368 (4), USNM 324502 (4), and UT 91.4203 (4); TU 89606 (89, 21–52), 5 August 1974; TU 125438 (13, 31–44), 15 May 1982; TU 151827 (175, 27–51), 17 April 1988; TU 162665 (2, 32 and 36), 9 April 1992; and TU 163053 (21, 30–48), 29 April 1992.

OTHER PARATYPES: UMMZ 88848-49 (44, 19–42), Blount Springs Cr., along US Hwy 31, 10 mi N Warrior, trib. to Mulberry Fk., Blount Co., AL; UMMZ 168582 (2, 33 and 36), trib. to Mulberry Fk., 5 mi SW Blountsville (T11N, R1W, Sec ca. 32), Blount Co., AL; UMMZ 168592 (1, 26), trib. to Mulberry Fk., 2 mi N Blountsville (T11N, R1W, Sec 12), Blount Co., AL; UMMZ 177736 (30, 27–46), trib. to Blount Springs Cr., S Blount Springs (T13N, R24, Sec ca. 18), Blount Co., AL; USNM 166360 (32, 21–48), and USNM 166003 (27, 27–42), trib. to Mulberry Fk., along US Hwy 31, about 9 mi N Warrior, Blount Co., AL; and USNM 36736 (8, 32–47), Blount Springs, Blount Co., AL.

ADDITIONAL MATERIAL EXAMINED BUT NOT DESIGNATED AS TYPES: **Black Warrior River system, Alabama.** JEFFERSON COUNTY: TU 62670 (4), trib. to Valley Cr., 4.7 mi SW Bessemer at US Hwy 11 (T19S, R5W, Sec 36); TU 127804 (2), Fivemile Cr., trib. to Valley Cr. at McCalla (T19S, R5W, Sec 36), TU 140953 (7), TU 140976 (9), TU 162681 (42), TU 163017 (49), TU 163187 (9); TU 61944 (8), Gurley Cr. at Ala Hwy 79, 7.7 mi N Pinson (T14S, R1W, Sec 30). WINSTON COUNTY: UMMZ 168565 (2), W Fork Sipsey Fk., 6 mi E Double Springs (T10N, R6W, Sec 30). LAWRENCE COUNTY: TU 163061 (1), Borden Cr. at forest road (T8S, R8W, Sec 28). BLOUNT COUNTY: UMMZ 158288 (2), west flowing trib. to Locust Fk., 3 mi NNE Oneonta, Hwy 32 (T12N, R2E, Sec 9).

DIAGNOSIS: *Etheostoma bellator* is a member of the subgenus *Ulocentra* as defined by Bouchard (1977) and Bailey and Etnier (1988). Further, *E. bellator* lacks a premaxillary frenum and has vomerine teeth and in these respects is typical of members of the *E. duryi* species group of Bailey and Etnier (1988). *Etheostoma bellator* has a red ocellus in the first membrane of the spinous dorsal fin in adult males. Moreover, most females of both the Murphy Cr. and Fivemile Cr. populations have a red ocellus and a complete red, submarginal band in the spinous dorsal fin. In addition, the nuptial males display two distinctive color patterns. There are two series of more or less elongate blotches along the mid-lateral area of the body and these are separated by a pale area, particularly on the anterior half of the body. The other pattern is the narrowness of the bright orange stripe along the lower side.

DESCRIPTION: *Etheostoma bellator* reaches a maximum of 47 mm SL (females) to 58 mm SL (males). Sexual dimorphism and apparent sexual maturity occur at the end of the first year at a minimum of 25 mm SL (females) and 27 mm SL ((males). A few of the small males did not have fully developed nuptial color patterns such as were displayed by others of the same size.

Frequency distributions of scale and fin ray counts are presented in Tables 1 and 2. Number of vertebrae, branchiostegal rays, gill rakers and preoperculomandibular pores are presented in Table 3. The lateral line is usually complete with (41–) 45–51 (–55) scales. Occasionally the last scale is unpored. Transverse scales number 12 (3 specimens), 13 (42), 14 (106), 15 (73), or 16 (16). Transverse scales from origin of second dorsal fin to anal fin (an alternative count, see Bailey and Etnier, 1988: 30) 11(3), 12(20), 13(46), 14(8); mean of 77 counts, 12.8. Caudal peduncle scale rows number 15 (4), 16 (19), 17 (169), 18 (65), 19 (55), 20 (1), or 21 (1). The dorsal fin has (9–) 10–11 spines and (9–) 10–12 soft rays. The anal fin has 2 spines and 6–7 (–8), modally 7, soft rays. The pectoral fin has 13–15 rays. Branchiostegal rays number 5—5 (290), 5—6 (1), 6—5 (5), 6—6 (6) in 302 specimens; vertebrae number 37 (1), 38 (57), or 39 (9) and gill rakers on first arch number 7 (6), 8 (35), 9 (27), or 10 (2). The sum of left and right preoperculomandibular pores is nearly constant at 18 (in 124 of 132 specimens), the remaining eight have 17 or 19 pores. Typically the cheek, opercle, and nape are covered with exposed scales. Occasionally the opercle is not completely covered and also there may be a mixture of exposed and embedded scales. Infrequently there is a small median naked area on the nape just behind the occiput. The scales on the cheek are usually smaller than those on the opercle and frequently some are embedded. The prepectoral area ranges from being naked to completely covered with scales. The breast is usually naked but occasionally has one or a few scales, and the belly is completely covered with exposed scales.

All 10 specimens examined for dentition have a small cluster of one to four or five, usually two or three, teeth on the head of the vomer; there are no palatine teeth.

Proportional measurements appear in Tables 4 and 5. Eighteen of the 25 males were nuptial specimens taken between 4 April and 17 April. The two lots of five each of females were collected on 4 April 1972 and 17 April 1988.

Colors of live and freshly preserved nuptial specimens, collected in April during different years, are described from Murphy Cr. and Fivemile Cr. specimens (Figures 2-5, 9-10). During the height of the breeding time the nuptial male is brightly colored with turquoise on snout, lips, preorbital area, cheek,

TABLE 6. Measurements in thousandths of standard length for *Etheostoma colorosum* and *E. tallapoosae* males.

| | *E. colorosum* (N = 25) | | | *E. tallapoosae* (N = 25) | | |
|---|---|---|---|---|---|---|
| | Range | x̄ | S.D. | Range | x̄ | S.D. |
| Standard length (mm) | 40.6—53.5 | 47.9 | 3.5 | 43.2—61.2 | 48.8 | 3.8 |
| Head length | 242—272 | 257 | 8.3 | 236—262 | 249 | 8.1 |
| Body depth at dorsal origin | 177—224 | 194 | 9.8 | 191—220 | 203 | 8.6 |
| Snout length | 66—81 | 73 | 3.3 | 66—79 | 72 | 4.0 |
| Orbit length | 63—75 | 68 | 2.8 | 57—67 | 63 | 2.6 |
| Spinous dorsal fin length | 273—319 | 300 | 12.3 | 265—308 | 290 | 10.6 |
| Longest dorsal spine | 133—182 | 154 | 11.1 | 99—142 | 120 | 10.9 |
| Soft dorsal fin length | 281—338 | 308 | 16.1 | 242—276 | 260 | 9.3 |
| Longest dorsal soft ray | 150—191 | 166 | 10.9 | 114—146 | 134 | 7.7 |
| Caudal peduncle length | 291—317 | 305 | 7.2 | 293—328 | 310 | 9.0 |
| Caudal peduncle depth | 92—112 | 98 | 5.0 | 99—113 | 106 | 3.7 |
| Anal fin length | 264—307 | 280 | 10.5 | 227—276 | 246 | 11.4 |
| First anal spine length | 50—91 | 72 | 8.5 | 61—76 | 66 | 3.7 |
| Longest anal soft ray | 134—168 | 146 | 8.0 | 111—144 | 129 | 7.8 |
| Caudal fin length | 210—245 | 228 | 9.6 | 176—216 | 202 | 10.9 |
| Pectoral fin length | 260—343 | 290 | 18.7 | 221—271 | 250 | 14.3 |
| Pelvic fin length | 200—250 | 221 | 11.6 | 194—245 | 220 | 10.6 |
| Trans-pelvic width | 77—93 | 84 | 4.1 | 74—87 | 82 | 2.7 |
| Maximum body width | 123—156 | 137 | 7.2 | 126—164 | 142 | 7.4 |
| Interorbital width | 39—50 | 44 | 2.7 | 41—48 | 44 | 1.9 |

opercle, gular area, breast, prepectoral area, and top of head. The anterior two median dorsal saddle blotches and the two posterior ones on the caudal peduncle are dark turquoise as are the upper and lower procurrent margins of the caudal fin, the entire anal fin, the pelvic fins except for a pearly white marginal fringe, a narrow marginal fringe on the spinous dorsal and a broad marginal band on the soft dorsal fin. The spinous dorsal fin has a bright red ocellus in the first membrane that is followed by red blotches of less intensity in the succeeding membranes. All together these red blotches form a submarginal band across the entire fin. Proximal to the red band is a narrow, pale, cream-colored band (with yellowish fringe) across the fin and proximal to that is a narrow band of small black blotches. Another cream-colored band is immediately proximal to the black band. The median-dorsal saddle blotches seemingly have extensions of pigment onto the adjoining membranes of the fin. The soft-rayed dorsal fin has a broad marginal band of turquoise that is separated from the broad median band of red by a narrow, cream-colored area and, as described for the spinous dorsal, there is another cream-colored area proximal to the red band. There are extensions of black pigment onto the membranes of the fin at the two median-dorsal saddle blotches at the base of the fin. The lower half of the pectoral fin is nearly clear whereas the upper part has cream to yellow pigment along the rays.

The two series of more or less elongate blotches along the mid-lateral area of the body are bright orange or red posteriorly and russet anteriorly. The lower series is aligned along the lower margin of the lateral-line. The upper series is more or less fused with the lower series at its posterior extremity on the caudal peduncle but is noticeably separated from the lower series in its anterior half by a pale area. The two series of elongate blotches plus the cream- to pale rose-colored intermediate areas tend to obliterate the underlying brown lateral blotches.

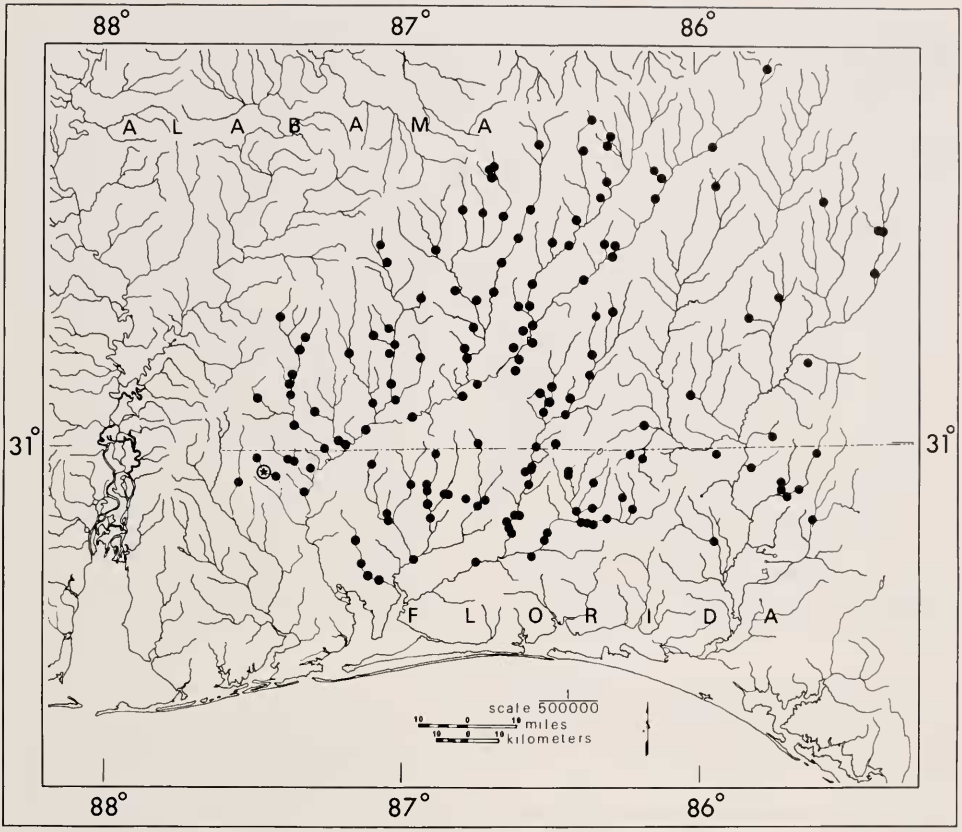



Figure 12. Distribution of *Etheostoma colorosum* (solid circles; type locality solid star in open circle).

During the winter when the bright nuptial colors have faded, the brown lateral blotches (quadrate or diamond-shape) are more pronounced and usually extend somewhat below the lateral-line. Nuptial males have a narrow orange stripe along the lower side. This orange stripe is separated from the lower ends of the brown lateral blotches. The double series of more or less elongate blotches separated by a pale area and a narrow stripe versus a broad band of orange along the lower side are diagnostic characters of *E. bellator*.

Nuptial females from both Murphy Creek and Fivemile Creek (Valley Creek system) populations have a submarginal red band in the spinous dorsal fin (Figures 9 and 10). Similar to the nuptial male, the anterior blotch (ocellus) is bright red whereas the blotches in the remainder of the band are subdued. Females of both populations exhibit some small flecks of chromatic color on the body. In addition, many Murphy Creek females have a red band across the middle of the second dorsal fin. This band is reduced in size and intensity of pigmentation in comparison to the respective red band in the nuptial male.

DISTRIBUTION: *Etheostoma bellator* is confined to the Black Warrior River system of northcentral Alabama (Figure 13). There are several disjunct populations. Our description is based on the Murphy Creek and the Valley Creek populations.

HABITAT AND BIOLOGY: *Etheostoma bellator* inhabits bedrock pools and raceways, rubble-strewn pools and fast water, riffles and moving water over gravel-filled depressions in bedrock pools of small to medium streams.

Based on collections made between 1972 and 1992, spawning extends from March through mid-May with the peak occurring in April. Four collections of types (all nuptial specimens) from Murphy Creek and five collections of nuptial specimens from Fivemile Creek (trib. to Valley Cr.) were analyzed for sex ratio, size range, and average size of nuptial specimens: a collection made on 4 April 1972 has 68 males and 110 females; another made on 17 April 1988 has 60 males and 114 females; a second collection made on 17 April 1988 has 39 males and 38 females; and a collection made on 29 April 1992 has 11 males and 10 females. The total for the four collections of types from Murphy Creek is 450 specimens, 178 males (39.5%) versus 272 females (60.4%). The males ranged in SL from 26.8 to 53.8 mm, mean 36.6 mm; the females ranged from 25.4 to 46.9 mm, mean 34.6 mm. The five collections from Fivemile Creek total 116 specimens; 44 males (37.9%) versus 72 females (62.1%). Males range from 32.9 to 54.1 mm SL, mean 39.6 mm, the females from 31.0 to 45.3 mm, mean 36.6 mm.

The species associates of *E. bellator* at the type locality area (Murphy and Mill Creeks) are as follows: *Hypentelium etowanum, Campostoma* sp., *Cyprinella callistia, C. venusta, Notropis asperifrons, Semotilus atromaculatus, Fundulus olivaceus, Lepomis cyanellus, L. macrochirus, L. microlophus, Micropterus coosae, M. salmoides, Etheostoma whipplei, Percina nigrofasciata*, and *Cottus carolinae*.

VARIATION: There are no dramatic differences in scale or fin-ray counts between the Murphy Creek and Valley Creek populations and there is no consistency in the slight differences that could be attributed directly to a north-south cline. The Valley Creek population, the more southern location, has a slightly higher lateral-line scale count, about the same transverse scale row and caudal peduncle scale counts, slightly higher dorsal spine count, about the same dorsal soft ray count, higher anal soft ray count, but a somewhat lower pectoral fin-ray count. The red band in the spinous dorsal and in the soft dorsal of some Murphy Creek males is wider than any observed in Valley Creek specimens. Females of both populations have a red band in the spinous dorsal fin, but only Murphy Creek females were observed to have a red band in the soft dorsal fin (Figures 9-11); samples from the two populations were not compared morphometrically and so the absence of discussion on this aspect does not automatically imply that the two populations are similar or alike in this respect.

COMPARISONS: *Etheostoma bellator* is more similar to *E. chermocki*, a recently described species (Boschung, Mayden, and Tomelleri, 1992), than to *E. zonistium* (Bailey and Etnier, 1988). All three species are inhabitants of the middle or upper portions of the Black Warrior River system, above the Fall Line. We could not confirm all statements made by Boschung et al. (1992) in their diagnosis of *E. chermocki* and their comparisons of *E. chermocki* and the 'Warrior darter' [= *bellator*]; we suspect this is because they did not fully appreciate the amount of variation in color intensity and pattern that is correlated with size of nuptial males of *E. chermocki* and the amount of variation in color pattern in both nuptial males and females of *E. bellator* (Figures 2-7, 9-11). We preface our remarks by noting that we have no color slides, prints, or recent color notes for nuptial males from Gurley Creek, the upper part of Sipsey Fork, or from the extreme

upper part of either the Mulberry or the Locust Fork. Our comparisons are based on recent color photos and color notes, recorded at time of collection, for *E. chermocki* from Turkey Creek and of *E. bellator* from Murphy Creek and Valley Creek populations.

A tabular comparison of salient characteristics of nuptial males of *E. bellator* and *E. chermocki* is presented in Table 7. We consider our specimen (Figure 6) and other males of about 55 mm or greater in SL to be in the larger male category for *E. chermocki*; our specimen (Figure 7) and the Boschung et al. (1992) specimen (Figure 1, A, male, illustrated by painting), to be in the smaller male category.

The red band in the spinous dorsal of nuptial males of the two species is distinctly different, but not always in the details illustrated and discussed by Boschung et al. (1992). Our observations indicate that the near-basal black band in the spinous dorsal fin is quite similar in width in the two species. We agree that the red band in the soft-rayed dorsal fin is typically broader in *E. chermocki* than in *E. bellator*, but find no significant differences in coloration of caudal, anal, and pectoral fins (in their diagnosis), nor are any portrayed in their Figures 1, A and C. Two statements in their diagnosis are perplexing: "The vermilion-colored venter extends dorsally and is *adjacent to* [emphasis added] lateral band;" and "Lateral blotches and brick-red coloration are *separated from* [emphasis added] the ventral vermilion coloration by straw-colored halos." None of our specimens, small or large, had straw-colored halos separating the red color of the ventral-lateral body area from the ventral margins of the lateral blotches. None of the females of *E. chermocki* in our collections taken with nuptial males had any chromatic coloration in the spinous dorsal such as displayed by female *E. bellator* from Murphy and Fivemile Creeks (Figures 9-11). Also, most females of *E. chermocki* had jet-black pigmentation in the posterior membrane of the spinous dorsal fin. A few *E. bellator* females from Fivemile Creek had a dusky posterior membrane.

Boschung et al. (1992: 13) stated that the nape is naked in *E. chermocki* whereas our observations reveal that most specimens have the nape completely covered with scales; a rare specimen has a narrow patch of naked skin immediately behind the occiput. Our gill raker counts range from 7 to 10 whereas they give a range of 5 to 7.

Comparison of data for *E. chermocki* and *E. bellator* males (Table 4) shows slight differences in the majority of the proportions, however, there are a few morphometrics that show moderate average differences: longest dorsal spine, longest dorsal soft ray, caudal peduncle length, and caudal fin length. Thus, in consideration of the four morphometrics there is a range in absolute separation from 15.8% to a maximum of 69.5%. In terms of overlap, the minimum is 30.5% to the maximum of 84.2% overlap.

*Etheostoma bellator* differs from *E. zonistium* in having fewer bands of color across the spinous dorsal fin and in having a narrow rather than broad stripe of orange or red on the lower side. The stripe of orange is well separated from the lateral-band pigmentation whereas in nuptial male *E. zonistium* the entire lower side is red, from the lower margin of the lateral stripe to the venter.

Status of Habitat: Mill Creek just above its confluence with Murphy Creek is being modified by a residential development. One of the initial steps of the project was to raise the height of the low dam on Mill Creek. The developer seems to be making an effort to retain some of the natural beauty of the area;

during a visit to the area in spring of 1992 there was no evidence of siltation below the dam. Fivemile Creek is moderately impacted by the residences in and around the town of McCalla. The continued maintenance of bridges and small roads, as well as an Interstate Highway that crosses the stream in the vicinity of McCalla, periodically contributes to disturbance of the stream bed and its banks.

ETYMOLOGY: The name *bellator*, Latin masculine noun, a warrior, is for the Black Warrior River drainage system to which the species is confined. We use the common name Warrior darter, following precedent of others who have referred to the species.

## ACKNOWLEDGMENTS

A list of all individuals who contributed toward the collecting of study material during the last five decades would be nearly endless. The following is a partial list of those who helped collect a few to many series: Marian K. Bailey, James M. Barkuloo, Henry L. Bart, Jr., William L. Brudon, John H. Caruso, Robert C. Cashner, Glenn H. Clemmer, Charles D. Hancock, Julian M. Humphries, Clyde Jones, Rudolf Meier, Maurice F. Mettee, Patrick E. O'Neil, J. Malcolm Pierson, Susan Pollock, John S. Ramsey, Dawn Remington, Steven Rohmann, Gerald R. Smith, Diana W. Stein, Jamie Thomerson, Bruce A. Thompson, Veronica Trau Colbert, and Ralph W. Yerger. We are grateful to M. F. Mettee, P. E. O'Neil, J. M. Pierson, and B. A. Thompson for their contributions of color slides. Paul R. Nichols, C. Lavett Smith, and Teruya Uyeno participated in the assembling of data, and Dr. Smith unselfishly withdrew from a planned description of *E. colorosum* initiated long ago. Several years ago R. D. Suttkus made a cursory examination of the University of Alabama's holdings of *E. bellator* and *E. colorosum* through the courtesy of H. T. Boschung and later additional lots were examined through the courtesy of R. L. Mayden. Although none of the specimens was used to determine meristics or morphometrics for this study, we have taken the liberty of adding some of the (UAIC) locality data to the distribution maps. More recently M. F. Mettee offered new records of *E. colorosum* that he and his staff at the Geological Survey of Alabama accumulated during the past two years; all new localities were added to our distribution map. To all of these individuals we express our deep appreciation.

We are especially indebted to John S. Ramsey for copies of his field notes, his detailed color notes of specimens in nuptial condition, his shared thinking about the relationships of the various species, and his preliminary key to all described and undescribed species of *Ulocentra* that were known during the early 1970's.

We thank Ralph W. Yerger for the early loan of the extensive collections of *E. colorosum* formerly housed at Florida State University. Too, we thank George Burgess for his prompt response to our request for University of Florida (UF) catalog numbers for the respective Florida State University series. We thank Henry L. Bart, Jr. for extending the loan of materials from Auburn University, and we are indebted to him and his staff for the many courtesies extended to us at the Tulane University Museum of Natural History, and to two anonymous reviewers.

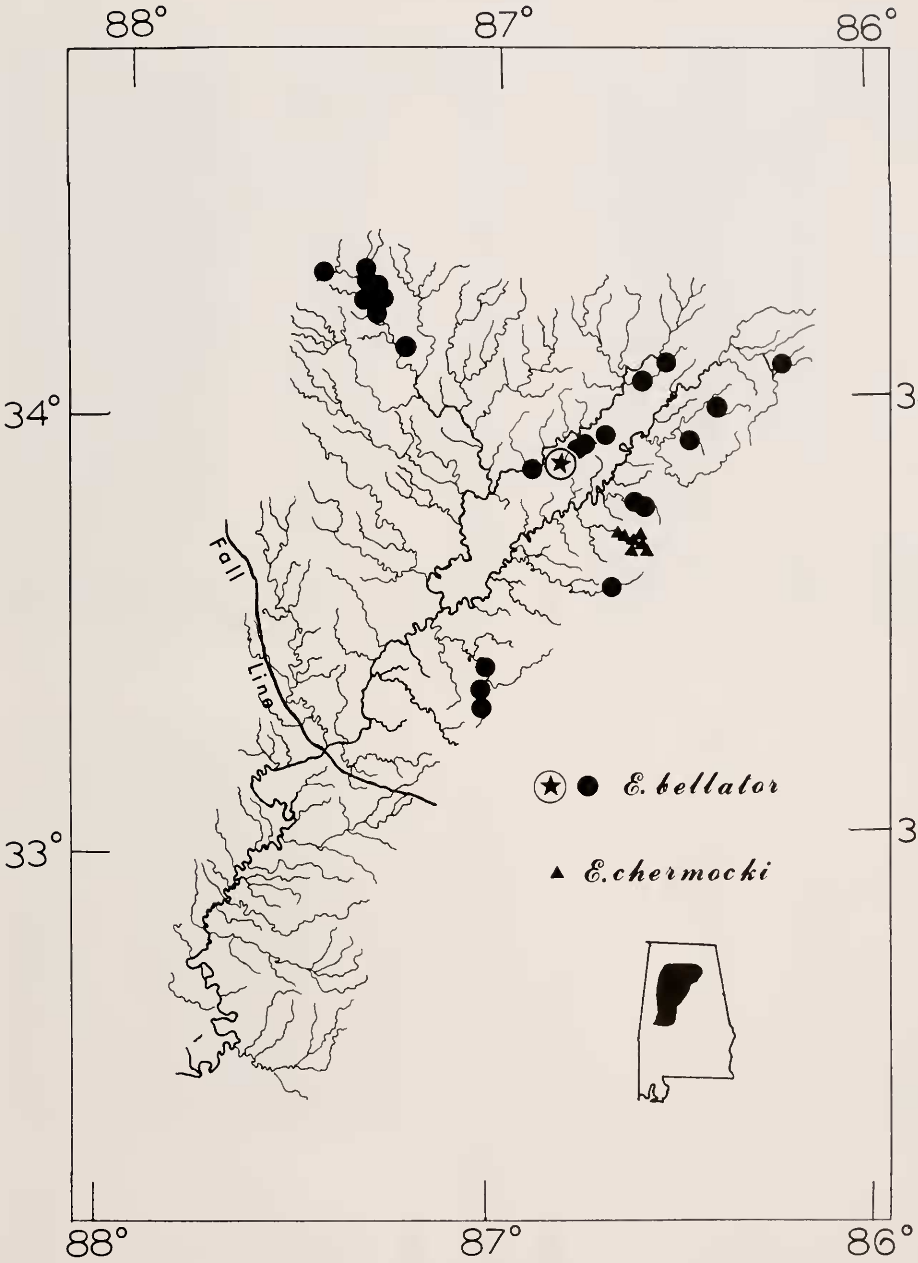



Figure 13. Black Warrior River system, Alabama, showing distribution of *Etheostoma bellator* (solid circles; type locality solid star in open circle), and *E. chermocki* (small solid triangles).

TABLE 7. Comparison of nuptial males of *Etheostoma bellator* and *E. chermocki.*

| Character | *E. bellator* | *E. chermocki* |
|---|---|---|
| SPINOUS DORSAL FIN | | |
| Marginal edging | thin edging of turquoise color | thin edging, clear or pale anteriorly, turquoise posteriorly |
| Ocellus in first membrane | bright red | bright red in smaller males, slightly darker in larger males |
| Submarginal red band | moderately wide, nearly uniform in width, often increasing in width posteriorly | variable in pattern, usually in two bands, separated anteriorly but with varying amount of inter-connection posteriorly; the outer band is narrow and weakly developed in its anterior third, behind the ocellus; the inner band is variable in width and intensity, and is usually incomplete, not extending to anterior margin of fin |
| Subbasal black band | narrow, uniform in intensity | similar, narrow, uniform in intensity |
| Cream colored bands, distal and proximal to black band | both present, fringed with yellow | both present in smaller males, fringed with yellow; inner band only developed in larger males |
| SOFT-RAYED DORSAL FIN Red band | typically relatively narrow in width, occasionally moderately broad | typically moderately broad |
| LATERAL BLOTCHES (centered along lower edge of lateral-line) | basically brown, nearly obliterated by overlay of flesh or pink coloration; some olive coloration extends, from dorsum, ventrad to upper edges of lateral blotches | basically brown, not obliterated by overlay of light colors; some olive coloration extends, from dorsum, ventrad to upper edges of lateral blotches |
| LATERAL BLOTCHES (centered above lateral-line) | mostly elongate blotches ranging from red posteriorly, to orange, to russet anteriorly; this series of blotches separated from lateral brown blotches (expecially anteriorly) by a pronounced pale area | elongate to oblong blotches ranging from bright red posteriorly to dull red anteriorly in smaller males and ranging from dull red posteriorly, to russet, to brown anteriorly in larger males; this series of blotches separated from lateral brown blotches (anteriorly only) by a very narrow pale area in smaller males, no separation in larger males |
| CHROMATIC COLORATION on dorsal-lateral area of body | scattering of flecks or small blotches of red or orange coloration | scattering of flecks or small blotches of red or orange in smaller males; no red or orange, instead, flecks or small blotches of brown or olive in larger males |

| | | |
|---|---|---|
| VENTRAL-LATERAL CHROMATIC COLORATION | narrow stripe of red or orange color, low on side, well separated from lower edges of lateral blotches | in smaller males a broad stripe of bright red extending nearly to ventral margins of lateral blotches at midbody, but extending to the ventral margins of blotches on caudal peduncle; in the larger males a broad stripe of dull red extending to ventral margins of lateral blotches at midbody as well as along caudal peduncle, and the dull red extends dorsad between the posterior blotches |
| OVERALL CONFIGURATION (Table 4; Boschung et al. Table 1) | more slender; caudal peduncle longer and dorsal fins lower | stockier; caudal peduncle shorter and dorsal fins more elevated |

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